910LMC

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR PATENT

Title of Invention

LASER MICROCLEANING APPARATUS AND METHODS

DESCRIPTION

Cross-reference to related application

AM 10/12/04 ~~This application is related to U.S. provisional patent application Ser. No. 60/047,907~~ ~~filed in the United States Patent and Trademark Office on 29 May 1997 and to international~~ ~~patent application PCT/US98/10658 filed on 26 May 1998.~~

AM 10/12/04 Claims benefit of which is a 371 of.

A.M 10/17/04

Technical Field

This invention relates to manufacturing methods and apparatus for cleaning semiconductor wafers and the like. More particularly, this invention relates to methods and apparatus for acquiring and for using information about location of particulate defects and relates to methods using a sacrificial film and laser irradiation to remove small particles.

Background Art

The semiconductor industry is moving into the 21st century with accelerating technological speed driven by small feature sizes and large wafers. This advanced technology capability will become increasingly more difficult to harness and more costly to implement. The Semiconductor Industry Association (SIA) Road map projects that the 0.18 micron/300 mm wafer technology generation in 2001 will require a level of 0.01 defects/cm^2 to produce high yield IC products. Not only is this density very low (2/3 defects per 300 mm wafer), but particles as small as 0.06 micrometer (approximately 100 atoms) in diameter can cause electrical IC product failures. Low defect levels are critical for economic success in the IC industry. Table 1 illustrates the effect of defect density level on test yield for several 0.18 micron products: A dynamic RAM memory (DRAM) of 1 Gigabits per chip, a 1000 MIP